

## **Aspects of the Surficial Geology to Satisfy EUB Guide 55 Requirements in the Athabasca Oil Sands In Situ Area**

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EUB Guide 55 identifies requirements to prevent soil, groundwater, and surface water contamination from materials that are produced or used at upstream petroleum sites (plant facilities, well sites, pipelines). Guide 55 presupposes that sites will be selected where the natural conditions (topography, hydrogeology, geology) minimize the potential for environmental concerns. Of these, the permeability of the near-surface soils most influences the site selection and the design of engineered earth structures, such as berms, containment ponds and natural liners. In situ clayey deposits (clay, till), are considered suitable materials for engineered structures if the hydraulic conductivity is  $\leq 1 \times 10^{-9}$  m/s, the plasticity index is low, and hydraulic 'defects', such as sand lenses, joints and fractures, are few to absent.

Reconnaissance mapping of the surficial geology in northeastern Alberta has characterized large areas where the natural materials either do not meet the criteria as 'clayey', or where lithological discontinuities, such as sand beds, significantly increase the bulk permeability of the unit. The eastern part of the in situ oil sands area (NTS 73M and 74D) is covered in many places by glaciofluvial sand, or sandy till, with abundant matrix sand (~50%) and/or numerous interbeds of sand. Enhanced vertical permeability is demonstrated by well-developed oxidized, luvisolic soil profiles, and vegetative cover such as Pine and Caribou moss, which indicate high internal drainage. This contrasts with areas to the west where the till matrix is more clayey, sand interbeds are few, and inclusions of glacially displaced shale and siltstone have been observed.